Problems in Math, Science Education Spur Varied Policy Initiatives

By Thomas Toch

New evidence of systemic problems in mathematics and science education was reported this summer as the Congress completed action on a long-delayed measure to upgrade instruction in the disciplines and several national groups announced related initiatives.

A task force of the American Chemical Society has concluded in a draft of a report to be published this fall that too little science is taught in elementary schools and that not enough laboratory work is done in high-school chemistry courses.

The panel, set up to study chemistry education nationwide, also asserts that chemistry courses are often taught by ill-trained teachers who are "spread too thin."

Chaired by Peter Yankwich, a chemistry professor at the University of Illinois at Urbana, the panel offered 40 recommendations, ranging from the establishment of federally supported regional science centers to encourage better science teaching in the schools, to the creation of model science curricula for each of the first eight grades.

Other Evidence of Problems

The troubled condition of mathematics and science instruction is also reflected in an analysis of some 12,000 transcripts from a sample of 1982 high-school graduates released recently by the National Center for Education Statistics.

According to the study, 1982 graduates took an average of only 2.2 years of science and 2.7 years of mathematics during their four years of high school. The N.C.E.S. also noted that the percentages of students who took advanced courses in mathematics and science "were generally small." Four percent of those surveyed, for example, took advanced chemistry; 1 percent took advanced physics.

Encouraging Signs

Legislation to deal with such problems cleared the Congress last month and is awaiting President Reagan's signature. The bill would establish a two-year, $965-million federal program to improve science and mathematics instruction in colleges and schools.

The bill calls for the U. S. Education Department to administer a $350-million effort to "improve instruction" in mathematics and science in fiscal 1984 and a $400-million program in fiscal 1985, which begins on October 1.

(According to Congressional staff, because fiscal 1984 ends on Sept. 30, the Congress is expected to shift the authorization for the program from fiscal 1984 and 1985 to fiscal 1985 and 1986.)

Ten percent of each year's appropriations would be spent at the Secretary's discretion, with the remainder going to the states in block grants. The bill stipulates that 70 percent of a state's allotment must be earmarked for the elementary and secondary levels.

In addition, the legislation calls for the National Science Foundation to administer a $70-million program in fiscal 1984 and a $140-million program in fiscal 1985 to upgrade teacher training, improve teaching materials, establish awards for outstanding teachers, provide scholarships for college graduates going into science teaching, and set up joint projects with the private sector.

Other Actions

The American Association for the Advancement of Science has received a $356,000 grant from the Carnegie Corporation of New York to sponsor an annual colloquium and publish an annual report on issues in precollegiate mathematics and science education.

Called "Spotlighting Science Education," the project will attempt "to keep the nation paying serious attention to science education for a decade or longer," according to F. James Rutherford, the organization's chief education officer and director of the project.

The first colloquium will be held in 1985; the first report will be published in the same year.

Teacher Training

Earlier this summer, the Council for Basic Education announced the establishment of 11 one-year institutes that will train or retrain 375 mathematics and science teachers in nine cities.

Each of the seven mathematics institutes and four science institutes will be a collaboration between a university, where the institutes will be housed, a local school system, and a philanthropic foundation or corporation that will fund the project.

Attempting to tackle the problem from a different direction, the National Aeronautics and Space Administration this summer unveiled a new program intended to encourage elementary-school students to develop an interest in science and mathematics.

"Operation Liftoff," announced at a Washington ceremony by President Reagan, will include, among other things, new written materials on aeronautics and space topics for the elementary grades, the development of space-related programming for instructional television, and the creation of a "Young Astronauts" organization.

The program will cost $3 million to $5 million over three years, according to NASA officials.

Foreign Imports Ease Georgia Teacher Shortage

To cope with a shortage of mathematics and science teachers, the State of Georgia has begun to recruit them from West Germany, where there is a large surplus of instructors.

A team of Georgia educators interviewed 30 candidates in Germany this summer and hired 8 to fill vacancies in 6 county school systems in the state for one year, beginning this fall.

They will be paid the state's starting salary of $14,526. If the program is successful, officials say, it will be expanded next year.

"It's a stop-gap measure," said Werner Rogers, associate state superintendent.

"We don't look at this as an answer to our problems, but the shortage of qualified mathematics and science teachers is getting more critical each day," he added.

High-Caliber Teachers

The officials note that in some of the state's school systems, substitutes were placed in mathematics and science classrooms for up to eight weeks last year because of the teacher shortage.

They say they are pleased with the caliber of the German teachers they recruited. They are "extremely well prepared," says Mr. Rogers.

Like all prospective German teachers, the eight who will be teaching in Georgia this fall completed a double undergraduate major in their subject areas, graduate training in teaching techniques, and an 18-month teaching internship.

All of the teachers are fluent in English, a result of a requirement that all West German students study English from the 5th grade through high school.

According to West German estimates, the country has a surplus of 40,000 teachers. —P.B.

Average Number of Years of Science and Mathematics Taken by Sophomores in 1980 (by selected characteristics)

Subgroup	Science	Mathematics
All students	2.2	2.7
Sex:		
Male	2.4	2.7
Female	2.1	2.6
Race/ethnicity:		
Hispanic	1.9	2.4
Black	2.1	2.6
American Indian	2.0	2.3
Asian American	2.7	3.2
White	2.3	2.7
High-school program:[1]		
Academic	2.9	3.3
General	2.1	2.5
Vocational	1.7	2.2
Socioeconomic status:[2]		
High	2.7	3.1
Middle	2.2	2.6
Low	1.9	2.3
School type:		
Public	2.2	2.6
Catholic	2.5	3.3
Other private[3]	2.6	3.1
Educational aspiration:		
High school only	1.7	2.1
Some college	1.9	2.4
Four-year college or more	2.8	3.2
Region:		
New England	2.6	3.0
Middle Atlantic	2.6	2.9
South Atlantic	2.3	2.7
East South Central	2.2	2.5
West South Central	2.3	2.8
East North Central	2.0	2.5
West North Central	2.3	2.7
Mountain	2.1	2.4
Pacific	1.8	2.6

[1] Based on student self-reports in 1980.
[2] Socioeconomic (S.E.S.) status was measured by a composite score of five equally weighted components: father's education, mother's education, father's occupation, parental income, and household items. Respondents were classified into one of the three subgroups (lowest, middle two, and highest quartile) based on the weighted S.E.S. distribution.
[3] Estimates for this type of school are not as accurate as those from other types of schools because of small sample size and a high non-response rate.

Source: National Center for Education Statistics

FOR THE RECORD

The following is the education plank of the Democratic Party's 1984 platform.

America's greatest resource is our people. As Democrats, we affirm the need for both public and private investment—in our children; in our educational institutions and our students; in jobs, training, and transitional assistance for our workers—to build America's future. If we choose wisely, these investments will be returned to our country many times over. They are essential if we are to create an America with high-quality jobs and rising opportunities for all. And they are vital if we are to safeguard our competitive position in the world economy.

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Simple decency demands that we make children one of our highest national priorities. But the argument for so acting goes well beyond that. Programs for children represent the most critical investment we can make in our ability to compete in future world markets and maintain a strong national defense in the decades ahead.

Above all else, the Democratic Party stands for making the proper investment in coming generations of Americans.

Preventive efforts must be at the heart of the broad range of health, child-care, and support programs for children. Helping these children makes good moral sense—and sound economic sense. Measles vaccine alone has saved $1.3 billion in medical costs in just 10 years. Supplemental food programs for low-income pregnant women and infants save $3 for every dollar spent.

By improving access to medical care before and after birth, we can promote a generation of healthy mothers and healthy babies. Seeing that supplemental food programs for low-income pregnant women and infants reach all those eligible will do more than save the $40,000 now spent to treat one low-birth-weight infant in a neo-natal ward. It will also reduce the risk of birth defects for such infants.

We recognize that a hungry child is a child who cannot learn. Restoring school breakfasts and school lunches for millions of children will improve their alertness and concentration in school.

Child care must also be a top priority. Helping communities establish after-school care programs will remove millions of American children from the serious risks they now face of injury, abuse, and alienation by staying at home alone. Encouraging employers, churches, public centers, and private groups to provide quality, affordable child care will give millions of children whose parents must work the kind of adult supervision necessary to thrive. And setting up centers for child care information and referral will assist parents wherever they reside to locate quality care for their children.

Preventing child abuse must be at the forefront of Democratic Party concern. Local, community-based child-abuse prevention programs must be strengthened and expanded. A child who learns first about the risks of sexual abuse in school will be less likely to become the target of repeated victimization. Federal challenge grants could encourage states to make local prevention efforts a real priority.

Prompt intervention efforts must also be provided for children in crisis. If we are to make any headway in breaking the cycle of child abuse, both victims and offenders must have access to treatment programs.

Juvenile offenders must not be left in adult jails where the only skills they acquire are those of the career criminal. Safe shelter and assistance must be available for the hundreds of thousands of runaway children at risk of exploitation in our cities. Local, state, and federal law-enforcement agencies must refine ways to locate children who have been abducted. And children in foster care must not be allowed to graduate to the streets at age 18 without ever having known a permanent home.

We must ensure that essential surveys on children's health and welfare status are reinstated. We

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pends on students, teachers, and parents performing at the highest level of achievement.

Today, education in America needs help. But, the Reagan Administration offers misleading homilies about the importance of education while agressively slashing education programs.

This is intolerable. We know that every dollar we invest in education is ultimately returned to us six-fold. We know that the education of our citizens is critical to our democracy.

There are four key goals that a Democratic program for educational excellence must address: strengthening local capacity to innovate and progress in public education and encourage parental involvement; renewing our efforts to ensure that all children, whatever their race, income, or sex have a fair and equal chance to learn; attracting the most talented young people into teaching and enabling them to remain and develop in their profession; and ensuring that all American families can send their children on to college or advanced training.

While education is the responsibility of local government, local governments already strapped for funds by this Administration cannot be expected to bear alone the burden of undertaking the efforts we need for quality education—from teacher training, to the salaries needed to attract and retain able teachers, to new labs, to new programs to motivate talented and gifted students, to new ties between businesses and schools—without leadership at the federal level.

Democrats will provide that leadership. We call for the immediate restoration of the cuts in funding of education programs by the Reagan Administration, and for a major new commitment to education. We will create a partnership for excellence among federal, state, and local governments. We will provide incentives to local school districts to concentrate on science, math, communications, and computer literacy; to provide access to advanced technology. In all of these fields, but particularly in computers, there is a growing danger of a two-tier education system. The more affluent districts have adequate hardware and teachers prepared to use it. Many districts are left completely behind or saddled with a modern machine but no provision for faculty training.

Every American child should have the basic education that makes computer literacy possible and useful. Major attention must be given to recruiting the finest young people into teaching careers, and to providing adequate staff-development programs that enable educators to increase their effectiveness in meeting the needs of all students.

Vocational education should be overhauled to bring instructional materials, equipment, and staff up to date with technology and practices of the workplace and target assistance to areas with large numbers of disadvantaged youth. We will insist that every child be afforded an equal opportunity to fulfill his or her potential. We will pay special attention to the needs of the handicapped.

Education is an important key to the upward mobility of all citizens and especially the disadvantaged, despite the fact that racial discrimination and other prejudices have set limits to such achievement.

The Reagan Administration has singled out for extinction the proven most successful education program—compensatory education for disadvantaged children. The Democratic Party will reverse this malicious onslaught and dramatically strengthen support in order to provide educational equity for all children.

Bilingual education enables children to achieve full competence in the English language and the academic success necessary to their full participation in the life of our nation. We reject the Reagan doubletalk on bilingual education and commit ourselves to expanding and increasing its effectiveness.

We will emphasize the importance of preventing one-third of our student body nationwide from dropping out of school in the first place. And, we will supplement community-based programs encouraging students who have left school due to teen-age parenthood, alcohol and drug abuse, or economic difficulties at home to complete their educations.

Recognizing that young people who are never given an opportunity for a job will be less likely to hold one in adulthood, we will also emphasize training and employment opportunities for youth. In so doing, we need to establish a genuine working partnership with the private sector.

Private schools, particularly parochial schools, are also an important part of our diverse educational system. Consistent with our tradition, the Democratic Party accepts its commitment to constitutionally acceptable methods of supporting the education of all pupils in schools which do not racially discriminate, and excluding so-called segregation academies. The party will continue to support federal education legislation which provides for the equitable participation in federal programs of all low- and moderate-income pupils.

For its part, when added to the traditional educational institutions of family, school, and church, television has enormous promise as a teacher. When children spend more time in front of the television set than they do in the classroom, we must ask how television can help children, and why commercial broadcasters do so little programming for children today despite their legal responsibility as "public trustees" of the airwaves granted to them. The National Science Board, for instance, has recommended that commercial television stations be required to air a certain amount of information/educational programming for children each week. Properly developed, television can be an enormously efficient and effective supplemental teaching tool.

We will make certain that higher education does not become a luxury affordable only by the children of the rich. That is Ronald Reagan's America. In our America, no qualified student should be deprived of the ability to go on to college because of financial circumstance.

The Democratic Party reaffirms the importance of historically black colleges. Today the survival of many of these colleges is threatened. The programs that assist them, which have been severely weakened in recent years, must be greatly strengthened with funding targeted toward black and Hispanic institutions.

An explosion in demand for certain types of engineers, scientists, and other technical specialists is creating a shortage of faculty and Ph.D. candidates. We must encourage colleges and universities to train more scientists and engineers. More than one hundred years ago the Morrill Land Grant Act provided for agricultural colleges and programs that today still help keep American agriculture the world leader. We need a similar program today to encourage the training of scientists and engineers. At the same time, we must not neglect the arts and humanities, which enrich our spirit. The private sector must also recognize its responsibility to join partnerships which strengthen our diverse public and private higher-education system.

Finally, all our educational institutions must adapt to growing numbers of adults returning to school to upgrade their skills, acquire new skills, prepare themselves for entirely new occupations, and enrich their lives.

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America is truly growing and prosperous when its spirit flourishes. The arts and humanities are at the core of our national experience. Creativity and the life of the mind have defined us at our best throughout our history. As scholars or artists, the museum-goers or students, craftsmen and craftswomen, or the millions who use our libraries, countless Americans have a stake in a nation that honors and rejoices in intelligence and imagination.

The Democratic Party will set a new national tone of respect for learning and artistic achievement. Not only will the federal agencies that support them be strengthened and freed from political intimidation, but the White House itself will once again be a place where American cultural and intellectual life—in all its rich diversity—is honored. Excellence must start at the top.

Finally, the Democratic Party is also committed to the survival of public television and radio stations, which allow all Americans, regardless of ability to pay, to appreciate high-quality, alternative programming. We oppose the efforts of the Reagan Administration to enact draconian cuts which would totally undermine the viability of this nation's excellent public-broadcasting system, a broadcasting system which has given the country "Sesame Street," "3-2-1 Contact," and other superb children's as well as cultural and public-affairs programming.

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We must have a growing economy if we are to have jobs for all Americans who seek work. But even in a growing economy, the pressures of competition and the pace of change ensure that while jobs are being created, others are being destroyed. Prosperity will not be evenly distributed among regions and communities. We must make special efforts to help families in economic transition who are faced with loss of homes, health benefits, and pensions. And far too many of our young people, especially minorities, do not have the training and skills they need to get their first job. Democrats believe that it is a national responsibility to ensure that the burdens of change are fairly shared and that every young American can take the first step up the ladder of economic opportunity.

Of the 8.5 million Americans still out of work, 40 percent are under 25. Unemployment among teen-agers stands at almost 20 percent. Less than three percent of the jobs created in the last three-and-a-half years have gone to young people. Black and Hispanic youth have a double burden. Unemployment for black teen-agers stands at 44 percent—a 20-percent increase in the last three years. Hispanic teens face a 26-percent unemployment rate.

As disturbing as these figures are, they do not tell the whole story. The unemployment rate measures only those teen-agers who were actively looking for work, not those who have given up, completely discouraged by the lack of opportunity. Again the burden falls disproportionally on minority youth.

The Reagan Administration has dismantled virtually all of the successful programs to train and employ young people. Today, we are spending less to put young people to work than we were even under the last Republican Administration—70 percent less, when inflation is taken into account. Youth unemployment has skyrocketed, while government efforts to combat it have dwindled to a trickle.

Unless we address this problem now, half of an entire generation may never know what it means to work. America cannot successfully compete in the world economy if a significant portion of our future work force is illiterate, unskilled, and unemployable.

The Democratic Party must give our young people new skills and new hope; we must work hand in hand with the private sector if job training is to lead to jobs. Specifically, targeted efforts are needed to address the urgent problem of unemployment among minority teenagers. We must provide job training for those who have dropped out of school, and take every step to expand educational opportunity for those still in school. We must recognize the special needs of the over-age-50 worker and the displaced homemaker. Through education, training, and retraining we must reduce these dangerously high levels of unemployment.

Teachers Back Reforms, Poll Finds

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members of unions, with union membership highest in the East (93 percent) and lowest in the South (54 percent), according to the poll.

Seventy-two percent of the survey participants said that teachers' opinions in general have not been given an adequate hearing in the current debate on education.

Virtually all of those surveyed (96 percent) said that they "love to teach," despite the fact that they spend too much time on administrative tasks (72 percent); that they "do not feel respected in today's society" (52 percent); and that they do not believe that their job allows them "the opportunity to earn a decent salary" (63 percent).

Those polled in the Metropolitan Life survey overwhelmingly approved (91 percent) tightening graduation requirements to include more academically demanding subjects.

Seventy-four percent approved of increasing the amount of homework assigned, 95 percent endorsed a renewed emphasis on school discipline and safety, and 92 percent agreed that instruction in computer use and foreign languages should be increased.

For a copy of the report, write to: The American Teacher Survey, Metropolitan Life Insurance Co., One Madison Ave., New York, N.Y. 10010.

Florida Funds 'Merit' Schools for 1985-86

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in the state can be meritorious. We think they all should be."

Ms. Holmes said the union is not telling the teachers it represents not to bargain on the program, but she added, "I don't think most of our teachers will bargain unless they can come up with something fair and nondiscriminatory and administratively feasible."

Test Scores Opposed

Jade Moore, executive director of the Pinellas Classroom Teachers Association, said his union would not go along with a program that uses test scores to determine teacher compensation.

"We will not participate in any plan that is inherently divisive, one that pits one group against another," Mr. Moore said.

Mr. Moore, whose district is the fifth largest in Florida, said parents may become concerned if their children go to a school that is not named as meritorious, particularly if the students are bused away from an area with a school that is labeled meritorious.

If it chooses to participate in the program, the Pinellas district will receive approximately $1.12 million in merit-school bonuses.

Ralph Turlington